

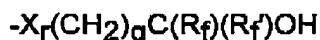
Application No.: 10/521,412
Docket No.: SR0015 USPCT

Page 2

Amendments to Claims

1. (Currently amended) A fluorine-containing copolymer ~~comprising~~ comprising:

(a.) a first repeat unit derived from an ethylenically unsaturated compound containing a functional group having the structure:



wherein

R_f and R_f' are the same or different C_1 - C_{10} fluoroalkyl groups, or taken together are $(\text{CF}_2)_n$;

n is an integer from 2 to 10;

X is S, O, N, or P;

$q = 0$ and $r = 0$, or $q = 1$ and $r = 0$ or 1; and

(b.) a second repeat unit derived from an ~~acrylate selected from the group consisting of~~ $\text{CH}_2=\text{CRCO}_2\text{R}''$ and $\text{CH}_2=\text{C}(\text{CH}_2\text{OH})\text{CO}_2\text{R}'''$, wherein

R is H, F, or a C_1 - C_5 alkyl or fluoroalkyl group; and

R'' is a polycyclic C_5 - C_{50} alkyl group containing at least one hydroxyl group, group; and

~~R''' is a C_1 - C_{25} alkyl group.~~

2. (Canceled)

3. (Original) The fluorine-containing copolymer of Claim 1, wherein (b) is hydroxyadamantyl acrylate.

4. (Original) The fluorine-containing copolymer of Claim 3, wherein the polymer further comprises a repeat unit derived from 2-methyl-2-adamantyl acrylate.

5. (Original) The fluorine-containing copolymer of Claim 4 made by a semi-batch synthesis.

6. (Original) The fluorine-containing copolymer of Claim 1, further comprising a repeat unit derived from a fluoroolefin selected from the group of ethylenically unsaturated compounds containing at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom.

7. (Original) The fluorine-containing copolymer of Claim 6, wherein the fluoroolefin is selected from the group consisting of tetrafluoroethylene,

Application No.: 10/521,412
Docket No.: SR0015 USPCT

Page 3

chlorotrifluoroethylene, hexafluoropropylene, trifluoroethylene, and $R_f\text{OCF}=\text{CF}_2$ wherein R_f is a saturated fluoroalkyl group of from 1 to 10 carbon atoms.

8. (Original) The fluorine-containing copolymer of Claim 1, wherein $r=0$ and $q=0$.

9. (Original) The fluorine-containing copolymer of Claim 1, wherein $q=1$ and $r=0$.

10. (Original) The fluorine-containing copolymer of Claim 1, wherein $q=1$ and $r=1$ and X is S, O, N or P.

11. (Original) The fluorine-containing copolymer of Claim 1, further comprising a repeat unit derived from at least one ethylenically unsaturated compound containing a functional group having the structure



wherein R_f and R_f' are the same or different fluoroalkyl groups of from 1 to 10 carbon atoms or taken together are $(\text{CF}_2)_n$ wherein n is 2 to 10 and R_a is an acid- or base-labile protecting group.

12. (Original) The fluorine-containing copolymer of Claim 11, wherein R_a is $\text{CH}_2\text{OCH}_2\text{R}_{15}$, and R_{15} is hydrogen, a linear C_1 - C_{10} alkyl, or a branched C_3 - C_{10} alkyl group.

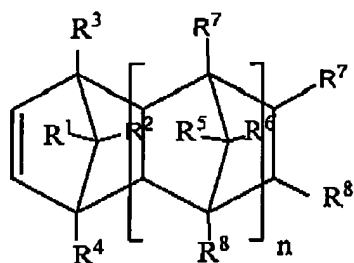
13. (Original) The fluorine-containing copolymer of Claim 1, wherein the functional group of repeat unit (a) is $-\text{C}(\text{CF}_3)_2\text{OH}$.

14. (Original) The fluorine-containing copolymer of Claim 6, wherein at least one repeat unit is cyclic or polycyclic.

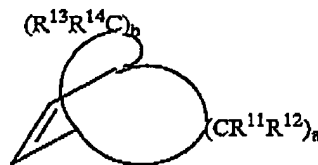
15. (Original) The fluorine-containing copolymer of Claim 6, further comprising a repeat unit derived from a cyclic or polycyclic unsaturated compound, selected from the group of compounds represented by structures (H) or (I),

Application No.: 10/521,412
Docket No.: SR0015 USPCT

Page 4



(H)



(I)

wherein:

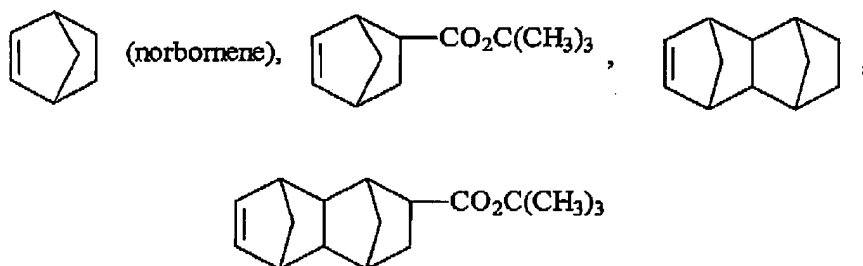
n is 0, 1 or 2;

a and b are independently 1, 2 or 3, except that a is not 1 when b is 2 or

vice versa; and

R¹ to R⁸ and R¹¹ to R¹⁴ are the same or different, and each represents a hydrogen atom, a halogen atom, a carboxyl group, a C₃ to C₁₄ secondary or tertiary alkyl carboxylate, a hydrocarbon group or a substituted hydrocarbon group.

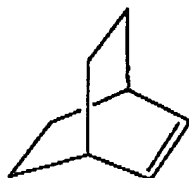
16. (Original) The fluorine-containing copolymer of Claim 15, wherein the cyclic or polycyclic unsaturated compound is selected from the group consisting of:



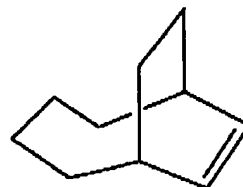
~~46.~~ 17. (Currently amended) The fluorine-containing copolymer of Claim 15, wherein the cyclic or polycyclic unsaturated compound is selected from the group consisting of:

Application No.: 10/521,412
Docket No.: SR0015 USPCT

Page 5



(bicyclo[2.2.2]oct-2-ene),

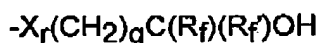


18. (Original) The fluorine-containing copolymer of Claim 7, wherein the fluoroolefin is tetrafluoroethylene.

19. (Currently amended) A photoresist comprising:

(a) a fluorine-containing copolymer comprising:

(i) a first repeat unit derived from an ethylenically unsaturated compound containing a functional group having the structure:



wherein

R_f and R_f' are the same or different C_1 - C_{10} fluoroalkyl groups, or taken together are $(\text{CF}_2)_n$;

n is an integer from 2 to 10;

X is S, O, N, or P;

$q = 0$ and $r = 0$, or $q = 1$ and $r = 0$ or 1 ; and

(ii) a second repeat unit derived from ~~an acrylate selected from the group consisting of~~ $\text{CH}_2=\text{CRCO}_2\text{R}''$ and $\text{CH}_2=\text{C}(\text{CH}_2\text{OH})\text{CO}_2\text{R}''$,

wherein

R is H, F, or a C_1 - C_5 alkyl or fluoroalkyl group; and

R'' is a polycyclic C_5 - C_{50} alkyl group containing at least one hydroxy group; and

~~R''' is a C_4 - C_{25} alkyl group; and~~

(b) at least one photoactive component.

20. (Original) The photoresist of Claim 19, further comprising a dissolution inhibitor.

21. (Original) The photoresist of Claim 19, further comprising a solvent.

Application No.: 10/521,412
Docket No.: SR0015 USPCT

Page 6

22. (Currently amended) A process for preparing a photoresist image on a substrate comprising, in order:

(1) applying a coatable photoresist composition on a substrate, wherein the coatable photoresist composition comprises:

(a) a fluorine-containing copolymer comprising:

(i) a first repeat unit derived from an ethylenically unsaturated compound containing a functional group having the structure:

$$-X_r(\text{CH}_2)_q\text{C}(\text{R}_f)(\text{R}_f')\text{OH}$$

wherein

R_f and R_f' are the same or different C_1 - C_{10} fluoroalkyl groups, or taken together are $(\text{CF}_2)_n$;

n is an integer from 2 to 10;

X is S, O, N, or P;

$q = 0$ and $r = 0$, or $q = 1$ and $r = 0$ or 1; and

(ii) a second repeat unit derived from ~~an acrylate selected from the group consisting of~~ $\text{CH}_2=\text{CRCO}_2\text{R}''$ and $\text{CH}_2=\text{C}(\text{CH}_2\text{OH})\text{CO}_2\text{R}'''$,

wherein

R is H, F, or a C_1 - C_5 alkyl or fluoroalkyl group;

R'' is a polycyclic C_5 - C_{50} alkyl group containing at least one hydroxy group; and

~~R''' is a C_1 - C_{25} alkyl group; and~~

(b) a photoactive component;

(c) a solvent; and

(2) drying the coatable photoresist composition to substantially remove the solvent to form a photoresist layer on the substrate;

(3) imagewise exposing the photoresist layer to form imaged and non-imaged areas; and

(4) developing the exposed photoresist layer having imaged and non-imaged areas to form a relief image on the substrate.

23. (Original) The process of Claim 22, wherein R_f and R_f' of the fluorine-containing copolymer are CF_3 .

Application No.: 10/521,412
Docket No.: SR0015 USPCT

Page 7

24. (Original) The process of Claim 22, wherein the developing step is performed with an aqueous alkaline developer.

25. (Original) The process of Claim 22, wherein the developing step is performed with a developer selected from the group consisting of a critical fluid, a halogenated organic solvent, and a non-halogenated organic solvent.

26. (Original) The process of Claim 25, wherein the critical fluid is carbon dioxide.

27. (Original) The process of Claim 25, wherein the halogenated solvent is a fluorocarbon compound.

28. (Original) An article of manufacture comprising a substrate coated with a photoresist composition of Claim 19.